US011044949B2

(12) **United States Patent**
Homer et al.

(10) **Patent No.: US 11,044,949 B2**
(45) **Date of Patent: *Jun. 29, 2021**

(54) **SYSTEMS AND METHODS FOR DYNAMIC DELIVERY OF WEB CONTENT**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **16/703,737**

(22) Filed: **Dec. 4, 2019**

(65) **Prior Publication Data**

US 2020/0104343 A1 Apr. 2, 2020

Related U.S. Application Data

(63) Continuation of application No. 14/093,015, filed on Nov. 28, 2013, now Pat. No. 10,521,492.

(51) **Int. Cl.**
G06F 16/958 (2019.01)
G06F 40/166 (2020.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A24F 47/008*** (2013.01); ***A24F 40/51*** (2020.01); ***H05B 3/265*** (2013.01); *H05B 2203/003* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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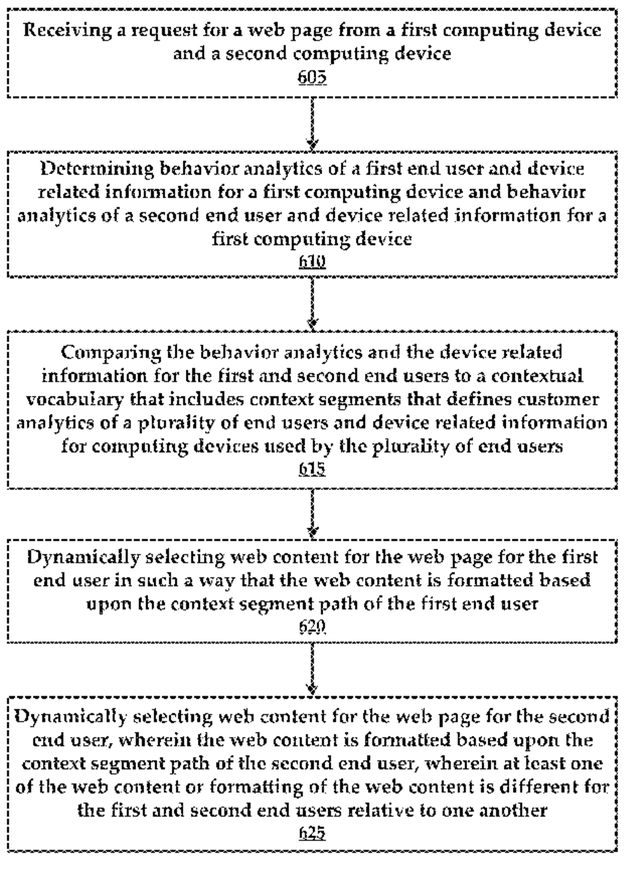
(57) **ABSTRACT**

Systems and methods for dynamically delivering web content are provided herein. A method may include determining behavior analytics of an end user and device related information for a first computing device used by the end user, as well as comparing the behavior analytics, and other contextual information, of an end user and the device related information for the first computing device used by the end user to a contextual vocabulary that includes context segments that define contextual information of a plurality of end users and device related information for computing devices used by the plurality of end users. The method includes generating a context segment path for an end user, the context segment path having a plurality of context segments that have been selected from the contextual vocabulary, and dynamically creating a web page having web content that is selected and formatted based upon the context segment path.

20 Claims, 7 Drawing Sheets



(51) **Int. Cl.**

G06F 40/103	(2020.01)
G06F 16/957	(2019.01)
A24F 47/00	(2020.01)
H05B 3/26	(2006.01)
A24F 40/51	(2020.01)

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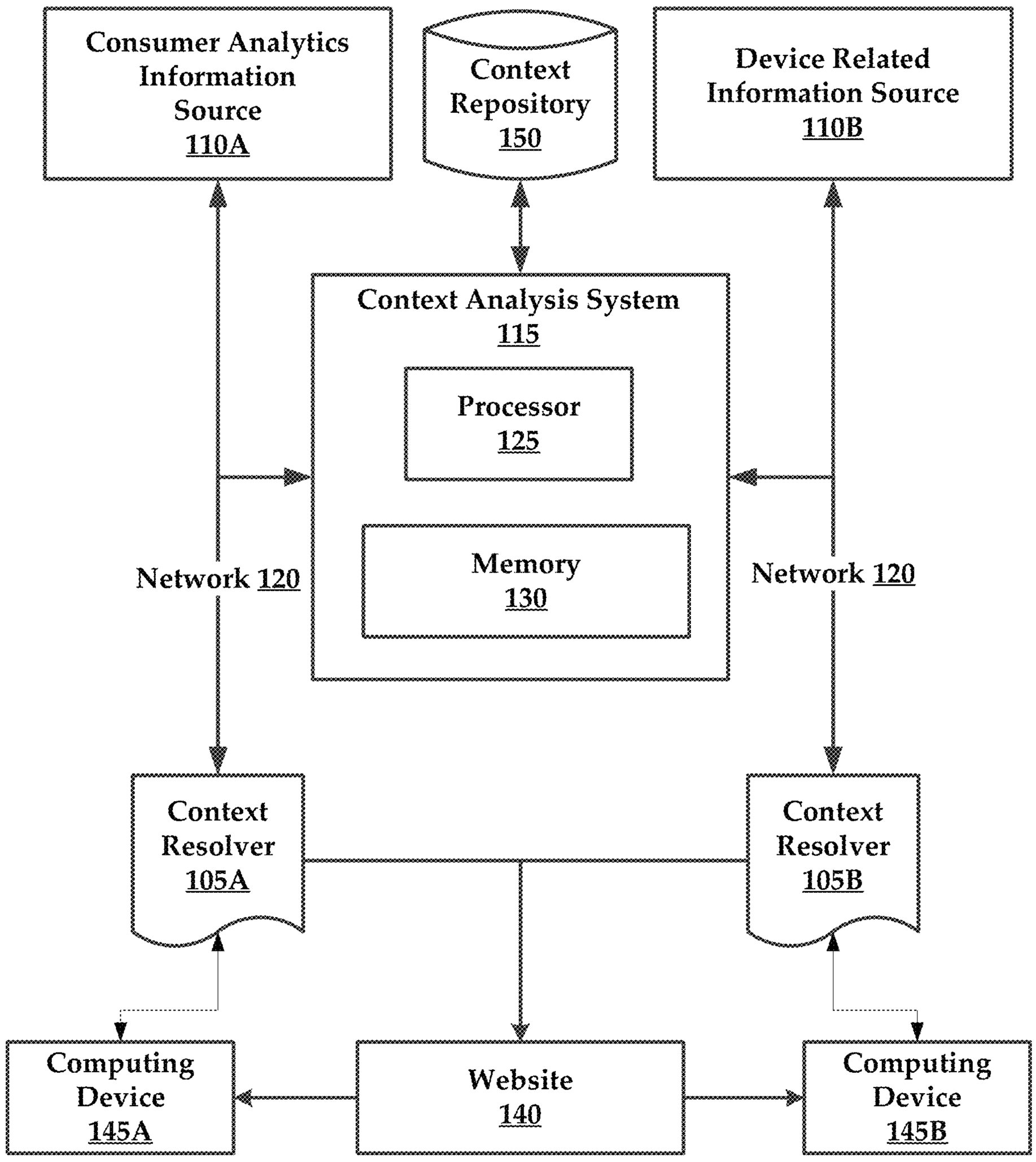
Consumer Analytics Information Source 110A
Context Repository 150
Device Related Information Source 110B
Context Analysis System 115
Processor 125
Memory 130
Network 120
Network 120
Context Resolver 105A
Context Resolver 105B
Computing Device 145A
Website 140
Computing Device 145B

FIG. 1

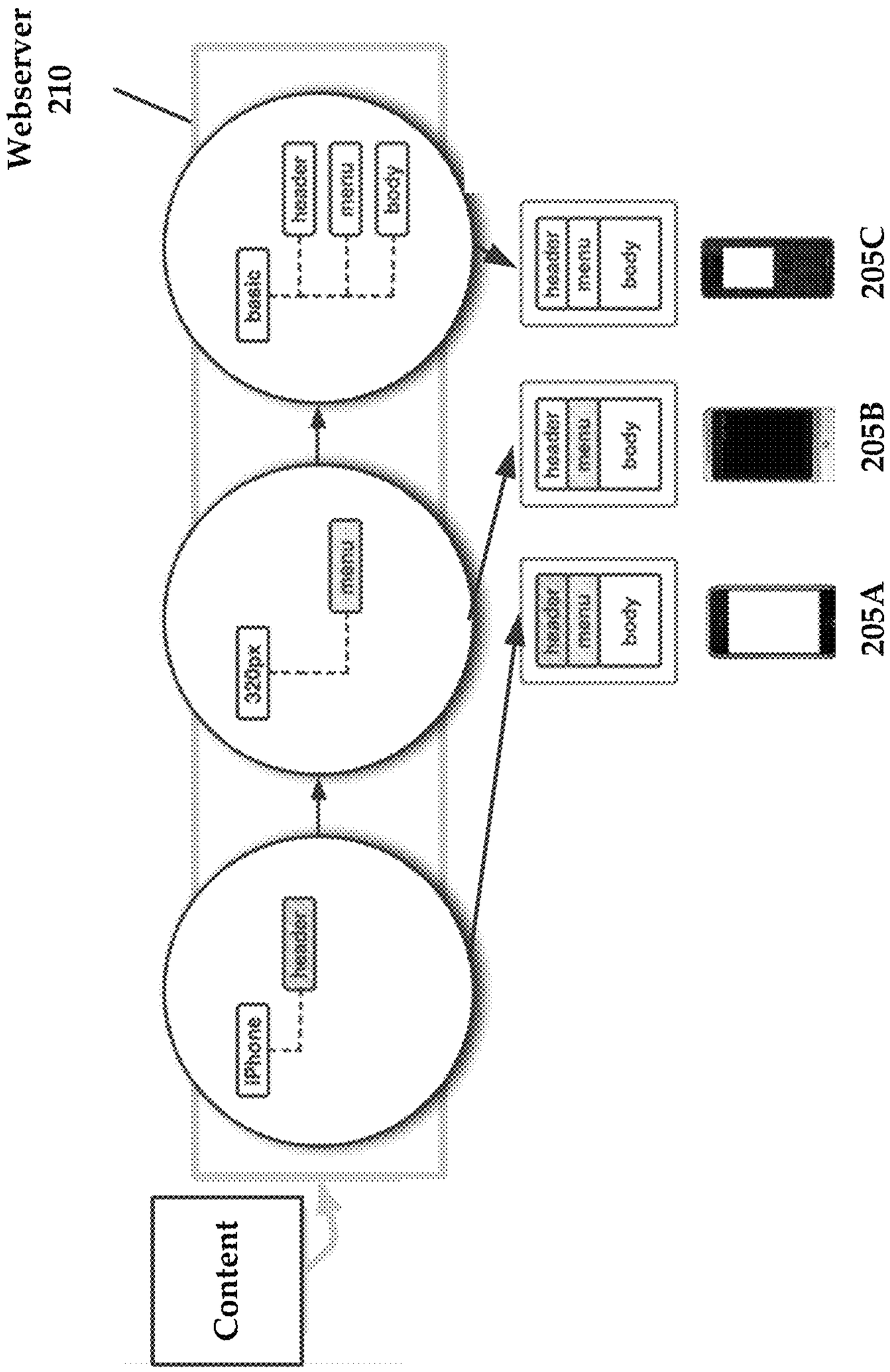
Webserver
210
header
menu
body
basic
header
menu
body
205C
header
menu
body
205B
header
menu
body
205A
320px
iPhone
Content

FIG. 2

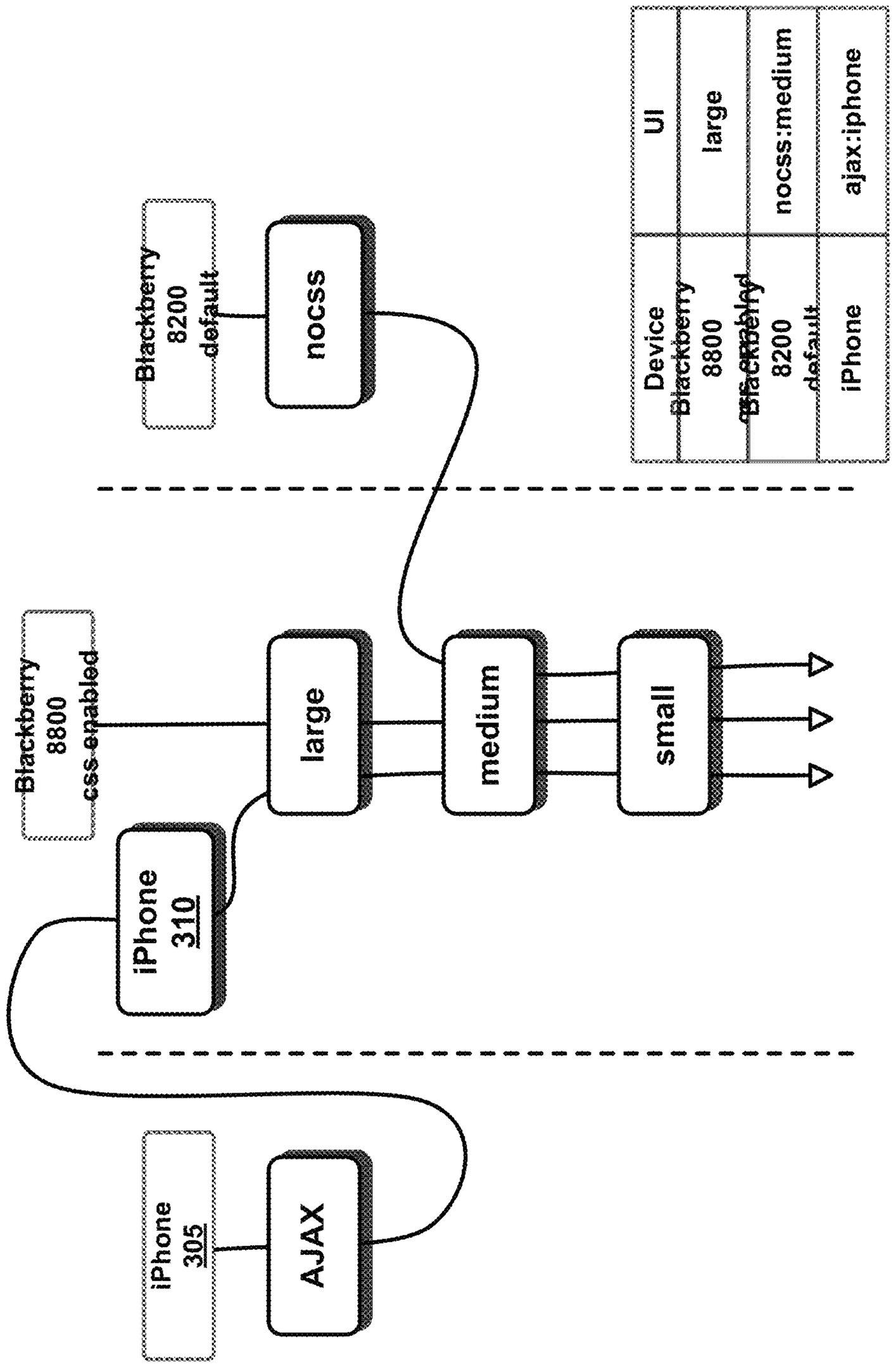
Blackberry 8200 default
nocss
Blackberry 8800 css-enabled
large
medium
small
iPhone 310
iPhone 305
AJAX
UI
large
nocss:medium
ajax:iphone
Device
Blackberry 8800
Blackberry 8200 default
iPhone

FIG. 3

UI	large	nocss:medium	ajax:iphone
Device	Blackberry 8800 css enabled	Blackberry 8200 default	iPhone
	→	→	----------→

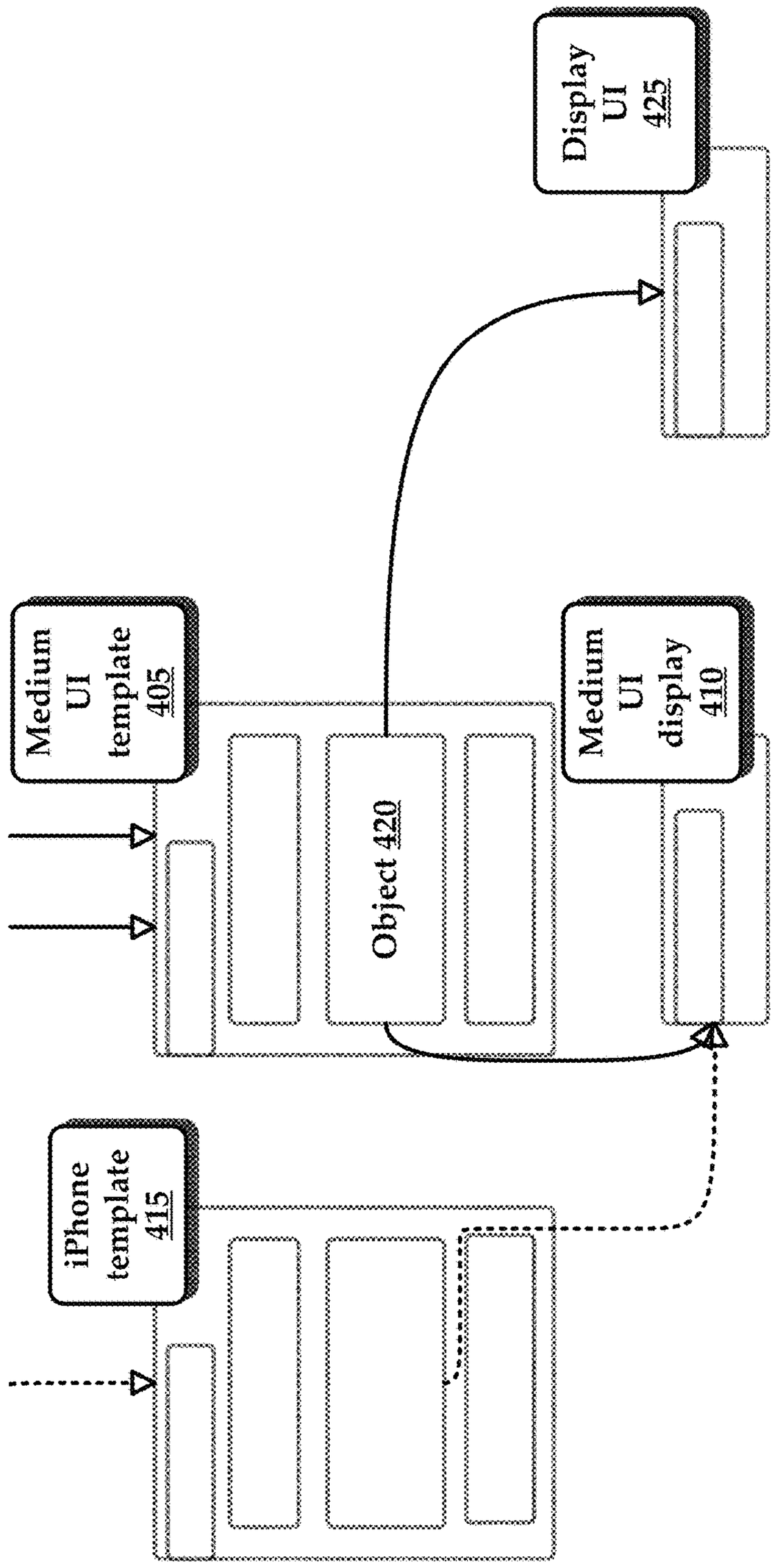

FIG. 4

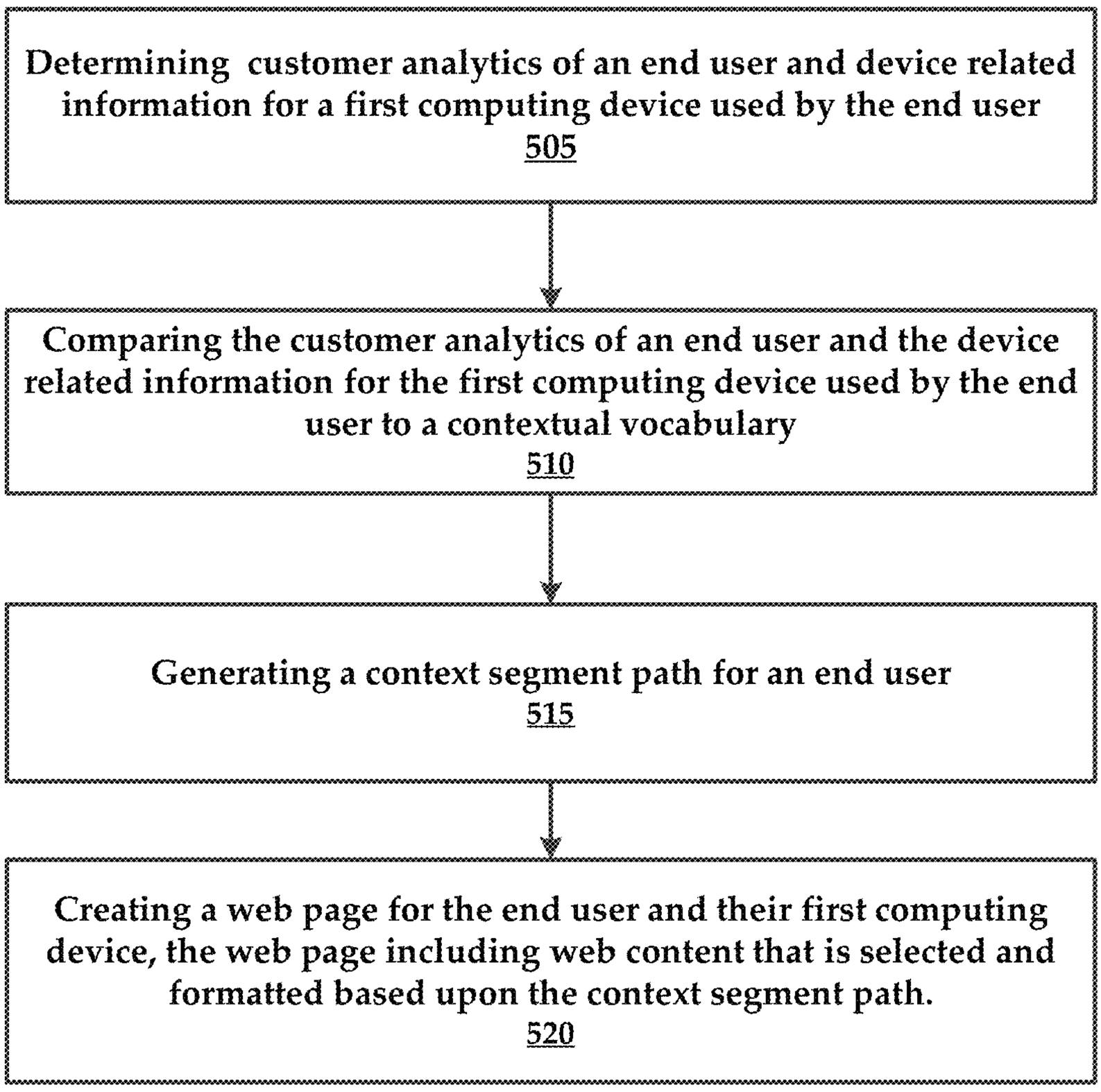
Determining customer analytics of an end user and device related information for a first computing device used by the end user
505
Comparing the customer analytics of an end user and the device related information for the first computing device used by the end user to a contextual vocabulary
510
Generating a context segment path for an end user
515
Creating a web page for the end user and their first computing device, the web page including web content that is selected and formatted based upon the context segment path.
520

FIG. 5

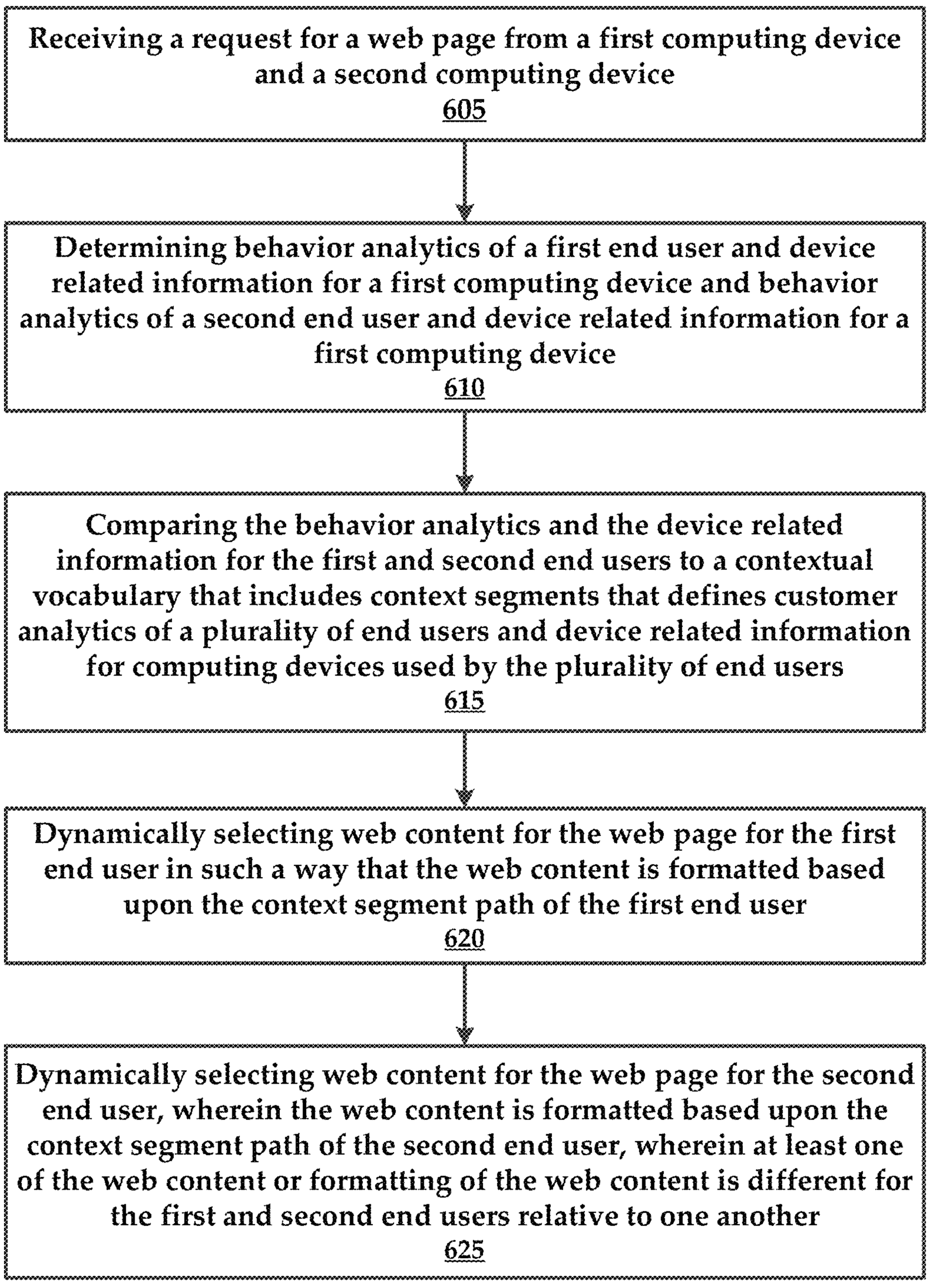
Receiving a request for a web page from a first computing device and a second computing device
605
Determining behavior analytics of a first end user and device related information for a first computing device and behavior analytics of a second end user and device related information for a first computing device
610
Comparing the behavior analytics and the device related information for the first and second end users to a contextual vocabulary that includes context segments that defines customer analytics of a plurality of end users and device related information for computing devices used by the plurality of end users
615
Dynamically selecting web content for the web page for the first end user in such a way that the web content is formatted based upon the context segment path of the first end user
620
Dynamically selecting web content for the web page for the second end user, wherein the web content is formatted based upon the context segment path of the second end user, wherein at least one of the web content or formatting of the web content is different for the first and second end users relative to one another
625

FIG. 6

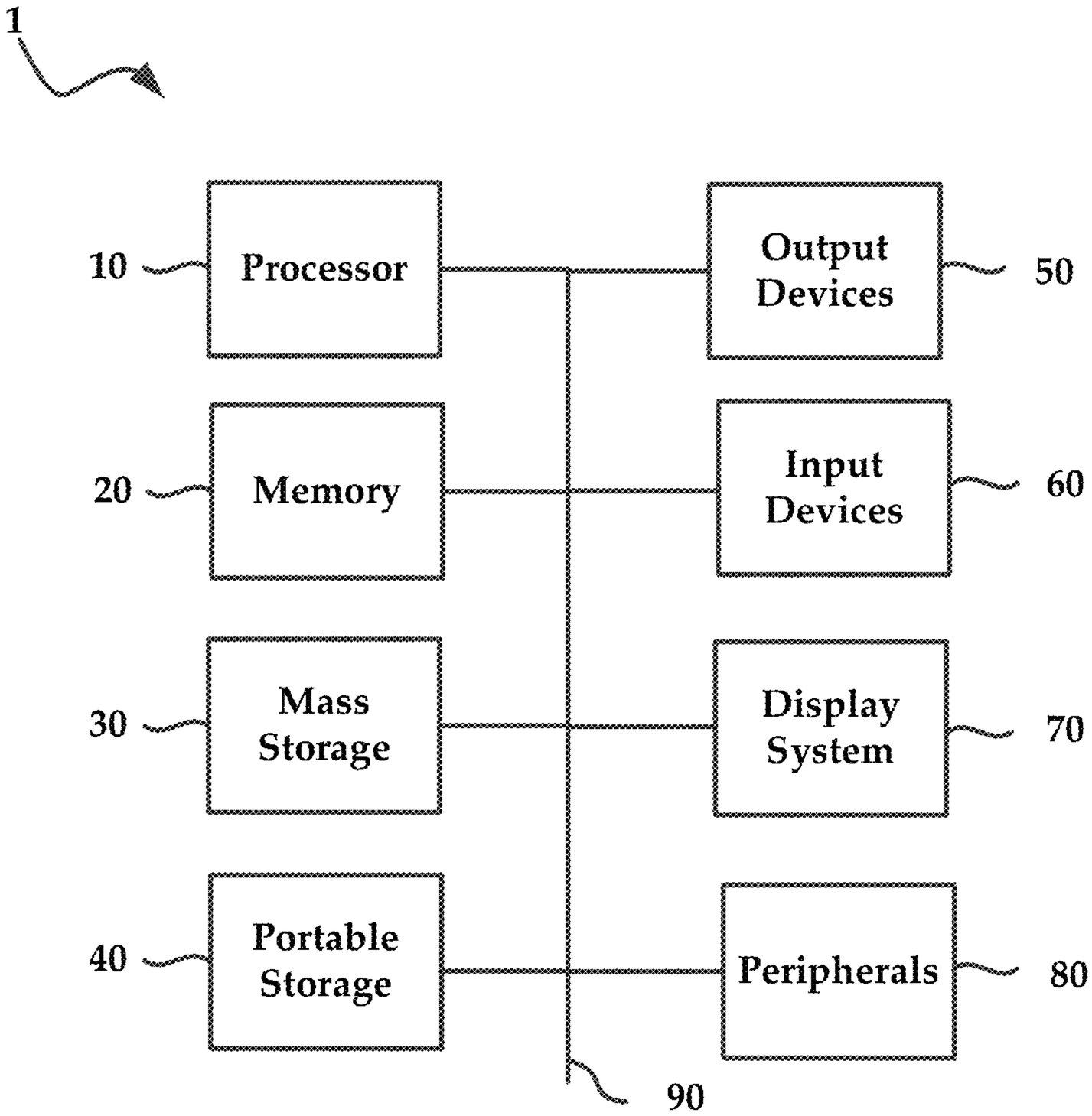
1
Processor
10
Memory
20
Mass Storage
30
Portable Storage
40
Output Devices
50
Input Devices
60
Display System
70
Peripherals
80
90

FIG. 7

SYSTEMS AND METHODS FOR DYNAMIC DELIVERY OF WEB CONTENT

CROSS REFERENCE TO RELATED APPLICATIONS

This U.S. Patent Application is a continuation application of U.S. patent application Ser. No. 14/093,015, filed on Nov. 28, 2013, now U.S. Pat. No. 10,521,492, titled "SYSTEMS AND METHODS THAT UTILZE CONTEXTUAL VOCABULARIES AND CUSTOMER SEGMENTATION TO DELIVER WEB CONTENT," which is hereby incorporated by reference herein in its entirety, including all references cited therein. This U.S. Patent Application is also related to U.S. Pat. No. 9,547,626, filed on Jan. 29, 2011, titled "SYSTEMS, METHODS, AND MEDIA FOR MANAGING AMBIENT ADAPTABILITY OF WEB APPLICATIONS AND WEB SERVICES", which is hereby incorporated by reference herein in its entirety, including all references cited therein.

FIELD OF THE TECHNOLOGY

Embodiments of the disclosure relate to web content management and delivery. More specifically, but not by way of limitation, the present technology is directed to systems and methods that create and utilize contextual vocabularies that describe the preferences or demographics of end users as well as the capabilities of the devices they utilize. The contextual vocabularies are built using a plurality of information sources, and may be used to service a plurality of target systems, allowing the target systems to customize web content for the end users and/or their device capabilities. Customer segmentation for categorizing consumers may also be utilized. The present technology may leverage both the contextual vocabularies and customer segmentations to customize web content for the consumer and their associated computing device(s).

BACKGROUND OF THE DISCLOSURE

Web content continues to grow and evolve in complexity and implementational diversity. Further, computing devices which access web content also continue to proliferate, creating diversity in device capabilities such as processing power and display attributes. For example, smartphones may be capable of rendering web content on a display that is much smaller than the display of a tablet. To effectively communicate with consumers that utilize various devices with vastly different capabilities, it is advantageous to tailor web content to the capabilities of various devices. Without such modifications, browser applications on many devices are required to display web content in a format that may not be desired by the web content authors.

SUMMARY OF THE DISCLOSURE

According to some embodiments, the present technology may be directed to a method for dynamically delivering web content. The method comprises: (a) determining behavior analytics of an end user and device related information for a first computing device used by the end user; (b) comparing the behavior analytics of an end user and the device related information for the first computing device used by the end user to a contextual vocabulary that includes context segments that define contextual information of a plurality of end users and device related information for computing devices used by the plurality of end users; (c) generating a context segment path for an end user, the context segment path comprising a plurality of context segments that have been selected from the contextual vocabulary, the context segment path being indicative of preferences of the end user and capabilities of the first computing device of the end user; and (d) dynamically creating a web page for the end user and their first computing device, the web page comprising web content that is selected and formatted based upon the context segment path.

According to other embodiments, the present technology may be directed to a contextual analysis system, the system comprising: (a) a processor; and (b) a memory for storing logic that when executed by the processor causes the system to: (i) determine behavior analytics of an end user and device related information for a first computing device used by the end user; (ii) compare the behavior analytics of an end user and the device related information for the first computing device used by the end user to a contextual vocabulary that includes context segments that define contextual information of a plurality of end users and device related information for computing devices used by the plurality of end users; (iii) generate a context segment path for an end user, the context segment path comprising a plurality of context segments that have been selected from the contextual vocabulary, the context segment path being indicative of preferences of the end user and capabilities of the first computing device of the end user; and (iv) dynamically create a web page for the end user and their first computing device, the web page comprising web content that is selected and formatted based upon the context segment path.

According to some embodiments, the present technology may be directed to a method for dynamically delivering web content. The method comprises: (a) receiving a request for a web page from a first computing device and a second computing device; (b) determining contextual information of a first end user and device related information for a first computing device and contextual information of a second end user and device related information for a first computing device; (c) comparing the behavior analytics and the device related information for the first and second end users to a contextual vocabulary that includes context segments that defines contextual information of a plurality of end users and device related information for computing devices used by the plurality of end users; (d) generating a context segment path for both the first and second end users, the context segment path comprising a plurality of context segments that have been selected from a contextual vocabulary, the context segment path being indicative of preferences of an end user and capabilities of a computing device of the end user; (e) dynamically selecting web content for the web page for the first end user, wherein the web content is formatted based upon the context segment path of the first end user; and (f) dynamically selecting web content for the web page for the second end user, wherein the web content is formatted based upon the context segment path of the second end user, wherein at least one of the web content or formatting of the web content is different for the first and second end users relative to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, where like reference numerals refer to identical or functionally similar elements throughout the separate views, together with the detailed description below, are incorporated in and form part of the specification, and serve to further illustrate embodiments of

concepts that include the claimed disclosure, and explain various principles and advantages of those embodiments.

The methods and systems disclosed herein have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

FIG. **1** is an exemplary computing architecture that may be used to practice aspects of the present technology;

FIG. **2** illustrates a process where a context analysis system delivers different web content to each of a plurality of computing devices based upon device capabilities;

FIG. **3** illustrates a process of multiple user interface inheritance;

FIG. **4** illustrates a process of user interface template loading for computing devices having different capabilities and properties;

FIG. **5** is a flowchart of a method for dynamically delivering web content using a contextual analysis system;

FIG. **6** is a flowchart of another method for dynamically delivering web content; and

FIG. **7** illustrates an exemplary computing system that may be used to implement embodiments according to the present technology.

DETAILED DESCRIPTION

In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosure. It will be apparent, however, to one skilled in the art, that the disclosure may be practiced without these specific details. In other instances, structures and devices are shown at block diagram form only in order to avoid obscuring the disclosure.

Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearances of the phrases "in one embodiment" or "in an embodiment" or "according to one embodiment" (or other phrases having similar import) at various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. Furthermore, depending on the context of discussion herein, a singular term may include its plural forms and a plural term may include its singular form. Similarly, a hyphenated term (e.g., "on-demand") may be occasionally interchangeably used with its non-hyphenated version (e.g., "on demand"), a capitalized entry (e.g., "Software") may be interchangeably used with its non-capitalized version (e.g., "software"), a plural term may be indicated with or without an apostrophe (e.g., PE's or PEs), and an italicized term (e.g., "N+1") may be interchangeably used with its non-italicized version (e.g., "N+1"). Such occasional interchangeable uses shall not be considered inconsistent with each other.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

It is noted at the outset that the terms "coupled," "connected", "connecting," "electrically connected," etc., are used interchangeably herein to generally refer to the condition of being electrically/electronically connected. Similarly, a first entity is considered to be in "communication" with a second entity (or entities) when the first entity electrically sends and/or receives (whether through wireline or wireless means) information signals (whether containing data information or non-data/control information) to the second entity regardless of the type (analog or digital) of those signals. It is further noted that various figures (including component diagrams) shown and discussed herein are for illustrative purpose only, and are not drawn to scale.

FIG. **1** is an exemplary computing architecture that may be used to practice aspects of the present technology. The architecture includes a plurality of context resolvers **105**A-B that are each associated with individual information sources. Multiple context resolvers may be utilized to aggregate contextual intelligence from multiple sources.

For example, context resolver **105**A may be associated with a consumer analytics information source **110**A, while context resolver **105**B may be associated with a device related information source **110**B. It will be understood that the present technology may include many context resolvers and information sources. Further, a single context resolver may be used to obtain information or analytics from a plurality of information sources. While two context resolvers are illustrated, it will be understood that many context resolvers may be utilized in accordance with the present technology.

The context resolvers, such as **105**A-B, may be included in a context analysis system **115**, or may be separate nodes or agents that communicatively couple with the context analysis system **115** and the information sources over a network **120**.

The context resolvers may be disposed between the context analysis system **115** and a website **140**. Examples of a plurality of context resolvers that can be utilized include, but are not limited to, resolvers that resolve context properties (e.g., contextual information) from customer databases, transactional databases, contextual information sources, context repositories, device discovery, expressions (evaluating expressions based on other properties), defaults (sensible defaults such that a given context property can never be not set), and other similar information sources.

In some embodiments, the context analysis system **115** may gather contextual information from ambient data sources that include ambient information. Ambient information is information that is observed from the continuous interactions between a plurality of users and a plurality of content and applications, along with a plurality of devices that the users use. This includes, but is not restricted to customer analytic information, content item properties consumed by users, and associated content metadata, contextual properties that are selected from a context repository (e.g. selection of relevant device properties from a device database), and information from users interactions with social networks—just to name a few.

According to some embodiments, contextual information obtained for the plurality of end users and the device related information obtained for the computing devices used by the plurality of end users may be stored by the context analysis system **115** in a context repository **150**. Further, contextual

segments and contextual segment paths, as described further herein, may also be stored in the context repository **150**.

In some embodiments, the context analysis system **115** may be implemented as a cloud-based computing environment, such as a virtual machine operating within a computing cloud. In other embodiments, context analysis system **115** may itself include a cloud-based computing environment, where the functionalities of context analysis system **115** are executed in a distributed fashion. Thus, context analysis system **115**, when configured as a computing cloud, may include pluralities of computing devices in various forms, as will be described in greater detail below.

In general, a cloud-based computing environment is a resource that typically combines the computational power of a large grouping of processors (such as within web servers) and/or that combines the storage capacity of a large grouping of computer memories or storage devices. Systems that provide cloud-based resources may be utilized exclusively by their owners or such systems may be accessible to outside users who deploy applications within the computing infrastructure to obtain the benefit of large computational or storage resources.

The cloud may be formed, for example, by a network of web servers that comprise a plurality of computing devices, such as the context analysis system **115**, with each server (or at least a plurality thereof) providing processor and/or storage resources. These servers may manage workloads provided by multiple users (e.g., cloud resource customers or other users). Typically, each user places workload demands upon the cloud that vary in real-time, sometimes dramatically. The nature and extent of these variations typically depends on the type of business associated with the user.

In some embodiments, the context analysis system **115** may include a server or other similar computing device that comprises at least a processor **125** and a memory **130**. The memory **130** includes logic (e.g., executable instructions) that when executed by the processor causes the context analysis system **115** to perform the methods or processes described herein, which include, but are not limited to the creation and use of contextual vocabularies and context segment paths.

In general, a context segment is any Boolean context property. A context segment path is an ordered list of segments that can be traversed to find the most appropriate resources. The path can be followed via a predetermined multiple fall-backs to find the first location where we find the desire resource. For the purpose of resource extension, where one resource may extend another, the path can be further followed to find the next relevant resource of the given name and so on.

Generally, a given segment can imply a plurality of other segments that are also automatically true, for example if a user is over 18 then they are also over 16, if a device is less than 320 pixels wide then it is also less than 640 pixels wide. This implies structure defines a multiple hierarchical structure that defines the order of the segment path that is traversed to find the most appropriate resources.

A serialized version of the context segment path is minimised by removing redundant inferred from the "implies" definition. For example "pc:640:320:128" can be minimised to "pc:640" since 640 implies 320 which implies 128. For a given vocabulary definition the serialized version of the context segment path provides a complete definition of the applicable context segments, with implied segments determinable from the context vocabulary definition.

Expressions that are implied from the "implies" definitions are not evaluated at runtime and are automatically set to true to minimise computational overhead at runtime.

A given segment can define a plurality of other segments that this given segment depends on such that this plurality of other segments must all be true before the given segment is evaluated. Segments may be defined as lazy such that are only evaluated on demand, and in the case of "depends" being defined, to minimise computational overhead at runtime, the segment is not evaluated if the plurality of segments that the given segment depends on are all set.

Generally, the context analysis system **115** may be configured to create and utilize contextual vocabularies that can be shared amongst web content creation and delivery systems. A contextual vocabulary can be created by the context analysis system **115** by obtaining contextual intelligence or information from a plurality of information sources using the context resolvers **105**A-B. In some embodiments, the information sources may include consumer analytical information gathered from user profiles created by customers, which would include any number of types of information such as usernames or handles, location information, language preferences, and a whole host of additional types of information that are indicative of the end user (e.g., customer).

The context analysis system **115** may also gather consumer analytical information from transactional data, such as customer purchase history or browsing history. In other instances, consumer analytical information may be gathered from web browser information or by the collection of web analytics from websites that are visited by the end user. These examples of consumer analytical information sources are merely a few of a vast number of consumer analytical information sources that would be known to one of ordinary skill in the art.

The present technology may also utilize device related information that is descriptive of the capabilities, properties, and/or attributes of a computing device used by an end user. Examples include, but are not limited to, processing attributes, software installed, input devices, hard drive size, memory size, display attributes, vendor & model, and as well as any other qualitative or quantitative attributes regard the computing device, battery life, and so forth. The device information may be gathered by context resolvers **105**A-B from available databases or client-side discovery, by scraping content from websites or other similar information sources. Generally, the terms properties and capabilities with regard to a computing device may be used interchangeable herein.

Advantageously, the context analysis system **115** may obtain both consumer analytical information and device related information from a plurality of independent information sources. When considering information from a wide variety of sources, the context analysis system **115** may calculate a trust level for each of the information sources and selectively utilize only those information sources that are reputable. In some instances, the context analysis system **115** may aggregate information from a plurality of sources with or without the use of a trust level.

In some embodiments each context resolver **105**A-B may apply trust levels to resolution on a per-property level (e.g., for each information source). Thus, a contextual vocabulary generated in light of these trust levels will reflect a property value with the highest trust levels for each named property. As used herein, the term "property" and "information source" may be used interchangeably.

Indeed, the context analysis system **115** may provide a trust-based distribution of context information that has been learned from and shared between multiple parties. Each piece of context information defines a provider of the information so that other nodes in the network can assign appropriate trust levels to the information provider, which is in turn imputed to the information obtained therefrom.

The contextual vocabulary is a collection of aspect definitions which in turn include a collection of property definitions that are defined or generated by the context analysis system **115**. The contextual vocabulary may include aggregated contextual properties in accordance with the context vocabulary that are comprised of information sources that are obtained from a wide variety of information sources.

The contextual properties may be generated by the context analysis system **115** from the aforementioned information sources. In some instances, the context vocabulary may comprise context segments that represent categorical attributes of end users or computing devices. For example, a categorical attribute of a user may include "under 30" or "high net worth" whereas a categorical attribute of a computing device may include "smartphone" or "retina display". In some instances, categorical attributes may be arranged hierarchically. For example, the "under 30" category is implicitly included in the category of "under 50". Thus, in some embodiments a context segment path may be generated from a multiple hierarchical representation of ordered context segments. For example, if a user is under 30 then it can be implied that they are under 40.

The context analysis system **115** can leverage granularity within these categories, creating more specific categories. These categories can be used to target specific promotions and advertisements to highly specific or broad groups of end users.

Some categorical attributes may include numerous dependent attributes. For example, the "smartphone" category may include a plurality of smartphone types that are determined from an analysis of device related information data sources. Thus, as end users interact with a website via diverse types of computing devices, the present technology may learn new types of smartphones that can be added to the smartphone category.

In some instances, categorical attributes may be shared amongst many types of devices. For example, many devices may use the same process or have the same display size or resolution.

In some instances, the inheritance of contextual segment information from a pre-defined contextual segment to another is defined by semantic property identifiers, thus a strict name-based hierarchy may not be required. This allows inheritance of contextual information to occur if such a semantically described contextual segment is pre-defined, although it will be understood that this contextual information may still be valid if the parent contextual segment did not exist. In some embodiments inheritance of contextual segments may occur on a per-aspect level. By way of non-limiting example, a browser-type inheritance is independent from device-type inheritance. For example, a computing device may utilize web browser client, but that web browser client is not necessarily indicative of the type of device (e.g., many devices may be configured with the web browser client).

As mentioned above, information included in a context segment may be dynamically adjusted by provision of new and/or more trusted contextual information.

In some embodiments, context segments are ordered such that a context segment can be assigned a higher precedence than another. This ordering of context segments by the context analysis system **115** may allow for optimal resource discovery, as will be described in greater detail below, where resource discovery is a process of determining which types of web content are most appropriate for the end user and their associated device.

Also, the context analysis system **115** may be configured to create context segment paths for end users. A context segment path may include a unique set of attributes that define the end user and their computing device. For example, the unique set of attributes may correspond to the contextual segments of the contextual vocabulary.

An example of a context segment path may include consumer analytics such as "under 30", "English language", and "U. K. resident", as well as a whole host of other analytics that may be determined from specific end user interactions with a website. For example, the end user may be browsing for travel related services for a specific date, or in connection with a particular event. This analytical knowledge may be combined with the more objective knowledge gained from, for example, a user profile or browser information.

The context analysis system **115** may calculate a context segment path for an end user by comparing the analytics of the end user (and their computing device) to the contextual vocabulary to determine applicable context segments for the end user. Again, the context segments are determined not only for the end user, but also the computing device used by the end user.

The context analysis system **115** may transmit the determined context segments that apply to the end user and their computing device to a website **140**. The website **140** then tailors web content for a web page to the determined analytics. Web content may be tailored to the requirements of a plurality of users that utilize a plurality of computing devices **145**A-B, where the web content that is provided to computing device **145**A is different from the web content that is provided to computing device **145**B. A detailed example of the delivery of tailored content is provided with respect to FIG. **2**.

The following describes an exemplary use case of the present technology. An end user from the United States interacts with a web page that is tailored to travel related services. As the end user interacts with the website, the context analysis system **115** obtains web analytic information from both a user profile for the user, as well as web history information collected as the end user utilizes the website. Further, device related information can be obtained from a web browser executing on a computing device used by the end user. Also, device characteristics such as user agent, cookies, IP address and geographic coordinates may be passed to the website when the computing device initiates a session with the webserver. Using one or more types of device related information, the context analysis system **115** may utilize context resolvers to obtain other types of computing device related information. For example, the system may determine a model number of a computing device. Using this model number, the system may use context resolvers to interrogate other sources of information relating to the computing device.

The context analysis system **115** may compute a context segment path for the end user and their device as described above. When the context segment path is computed, the context analysis system **115** may compare the context segment path to context segments of a contextual vocabulary. Again, the contextual vocabulary includes an aggregation of trusted information that defines both consumers and com-

puting devices. It will be understood that the trusted information includes information gathered from the information sources that were determined to have high trust levels.

The context analysis system **115** may utilize the trusted information to determine not only what type of web content is provided to the end user based upon their preferences or consumer segments, but also how the web content should be formatted for the computing device. For example, if the computing device has a small display and cannot display certain types of media, the context analysis system **115** may choose web content that is suitably displayed on the computing device. Also, the computing device analytics may specify that the device cannot easily or be rotated into a landscape position or scrolled. These types of device related information may aid the context analysis system **115** in selecting or tailoring offerings that are optimally displayed on the computing device.

Further, the web content may be tailored to the preferences or consumer segments of the end user. For example, the context analysis system **115** may determine that the end user is an affluent purchaser in the "under 30" category and that the end user has searched for travel related services to a particular location. Using all the above-described information, the context analysis system **115** may generate an offering for the end user that emphasizes a travel deal to the searched location, as well as hotel suggestions that include high-end properties. These offerings may be provided as a list that is easily and completely displayed on the computing device without any need for the end user to scroll for pertinent information.

Thus, from a given context segment path it is possible for the context analysis system **115** to reliably identify the most appropriate resources for a given context (e.g., best image, most appropriate HTML rendering, most appropriate advert, and so forth).

In some embodiments, a context segment path is embodied as a string that uniquely defines the context segment allocation for a given context, such as a browser or query session of an end user. The context segment path (with implicit segment inheritance) may include a minimized string that can be effectively be used as a cache key and reliably and efficiently serialized and de-serialized.

In some embodiments, the webserver that serves a website **140** that is configured to use the present technology may utilize web pages with HTML that is enhanced with attributes which can used to drive contextual rendering and optimization. These attributes may be executed by the web browser of the client device transparently such that they produce no noticeable side effects such as latency or erroneous web page renderings.

In some embodiments, the context analysis system **115** may utilize the contextual methods to optimize a web application delivery, for example optimization of images, rendering of most appropriate product recommendations, application of user customized themes, and so forth. The context analysis system **115** may choose at which stage the optimization can be applied. In some embodiments, the context analysis system **115** may optimize the web content when a request from an end user is received. In other instances, the context analysis system **115** may optimize the web content for the end user right before the webserver delivers the web content towards the browser. In other instances, the optimization may occur at the request of the computing device.

In some embodiments, context analysis system **115** can apply optimization based on an independent context expression evaluation (as well as that suggested by the content). For example, the context analysis system **115** may filter out new HTML functionality that is not supported for a given device, minimization of java script, or the use of a cached compilation of Less Cascade Style Sheets (CSS) or a software as a service (SaaS) implementation.

As mentioned above, the context analysis system **115** may allow for the tendering of web content based on context segmentation path. The context analysis system **115** may also provide an encapsulated rendering of web content in the form of a widget. For example, a map widget may include an encapsulation of context segments. When a computing device that is capable of using gestures requests use of the map widget, the map widget may provide a map UI that allows for gesture-based interactions. Conversely, when a computing device having limited capabilities requests use of the map widget, the map widget may provide a basic map UI that includes a legend or other descriptive information that would normally be obtained from interacting with the map using gestures or interactions.

The context analysis system **115** may encapsulate context rules within individual widgets in a way that is separate and distinct from how the web page that includes the widget is rendered. Thus, the rendering of one instance of web content for a web page does not directly affect how other web content or objects of the same web page are rendered, allowing for increased decoupling, increased reusability, and simpler quality control. Indeed, context-specific customization for individual widgets or objects can be modified with no regression risk to rendering for other contexts or end users.

In other instances, rendering for one context segment can extend the rendering for a fallback context segment. For example, a specific rendering for an iPhone can extend to a general smartphone context segment.

In some embodiments, the context analysis system **115** may publish for wider consumption, a contextual vocabulary for a website **140**, which may be included in a suite or group of websites. In some instances, the context analysis system **115** publishes the complete context vocabulary for all other sub-systems to view. Exemplary sub-systems may include other related websites, web content management systems, or web content distribution systems—just to name a few.

FIG. **2** illustrates a process where the context analysis system **115** delivers different web content to each of a plurality of computing devices **205**A-C based upon device capabilities. With regard to computing device **205**A which includes an iPhone device, a webserver **210** tailors content for an iPhone device. As described above, the iPhone contextual segment may be granular, where many versions of the iPhone are included in the general iPhone contextual segment. For example, unique models of the iPhone are associated with specific device capabilities that encompass display size and resolution, as well as other device capabilities. In response to this information, the context analysis system **115** tailors header and menu portions of web content **215**A in an optimal manner. For example, the menu may include a gesture activated menu that is optimized for an iPhone.

The computing device **205**B is determined by the context analysis system **115** to belong to a contextual segment of 320 pixel display devices. The context analysis system **115** may tailor the menu of the web content **215**B to include a resolution that is rendered optimally by a 320 pixel capable computing device.

The computing device **205**C is determined by the context analysis system **115** to belong to a contextual segment of basic display devices, which may include devices with lower

resolution displays or devices that have small display screens. The context analysis system **115** may generate a header, menu, and body that are of low resolution and limited complexity with regard to content type. Indeed, the context analysis system **115** may predominantly utilize textual content or a single image that includes textual content.

Regardless of how the web content is formatted in each of the above scenarios, the same informational content is displayed to each end user, albeit using different types of web content.

Conversely, while FIG. **2** illustrates the optimization of web content based upon device context, the context analysis system **115** may also tailor the web content based upon the contextual segments known for the end user.

In some embodiments, the context analysis system **115** may determine a customer segmentation for an end user based upon contextual information determined for the end user. In other embodiments the context analysis system **115** may also determine a customer segmentation of an end user based upon device related information determined from the computing device used by the end user. In yet other instances, the context analysis system **115** may determine a customer segmentation of an end user based upon both contextual information determined for the end user and device related information determined from the computing device used by the end user. It will be understood that while a contextual segment includes one or more parameters/attributes of an end user such as "under 30" or "college educated", a customer segmentation may include a broader categorization of the end user. Indeed, a customer segmentation may include a collection of contextual segments that define a category such as "affluent consumer", "technology aficionado", "world traveler" or other similar categories. For example, an end user that searches for high priced travel services and is determined to use a brand new and costly smartphone may be assigned a customer segmentation of "affluent consumer". In another example, it may be possible to infer a customer segmentation from only device related information for the end user. For example, if the end user is known to purchase a new laptop the same week a new laptop comes onto the market, the context analysis system **115** may assign the end user with a customer segmentation of "early technology adopter". This knowledge may be gleaned from encounters by the context analysis system **115** with a variety of computing devices for a single end user over a period of time. If the context analysis system **115** determines that the end user makes requests for web content using a computing device that is a brand new type of computing device, and that this pattern occurs frequently, the context analysis system **115** may infer that the end user prefers to purchase a new laptop as soon as such devices come onto the market. Many other examples of customer segmentation would be apparent to one of ordinary skill in the art.

As mentioned above with the examples included in FIG. **2**, the context analysis system **115** may be configured to dynamically create web content in accordance with consumer analytics and device capabilities of the computing device used by an end user. Because the creation and formatting of web content is directly related to the specific needs of the end user and their computing device, it will be understood that the web content for each end user may be different. The creation and delivery of dynamically formatted web content for different devices is illustrated in FIG. **3**.

Additionally, the context analysis system **115** may select or format web content that is tailored to the preferences, demographics, and/or other analytics that describe the end user. Further, both the preferences of the end user and the capabilities of their device may be considered when the context analysis system **115** generates web content. The term "web content" may be understood to include, for example, a web page that includes a plurality of elements such as images, videos, textual content, or other common web objects. The web page is often created in HTML or Flash format. Web pages may also depend on other objects such as cascading style sheets (CSS) that define how objects on a web page are formatted and displayed by a browser client.

FIG. **3** illustrates a process of multiple inheritance of user interfaces UI. Generally, device related information regarding an iPhone **305**, such as AJAX capabilities is known by the context analysis system **115**. The UI for this device may be inherited to another iPhone **310**, which can in turn be inherited to a Blackberry 8800 device that is cascading style sheet (CSS) enabled, allowing for large, medium, and small UI displays. Alternatively, a Blackberry 8200 device which is not CSS enabled is provided with a medium scale UI.

In general, having multiple hierarchy grouping of UIs make it easy to target specialist capabilities of computing devices while reusing common standards. UI Inheritance is used to load resources, for example, to load the page rendering for a given device. New capabilities (e.g. AJAX in this example) can easily be handled by creating additional hierarchies allowing you to deliver to new capability without regression risk on existing UI rendering.

FIG. **4** illustrates a process of template loading using the present technology. Page rendering templates are loaded based on the UI hierarchy fallback path allowing you to specialize the core building blocks when desired for a given device group. For example, an object **420** that is present in a medium UI template **405** may be inherited directly to a medium UI display **410**. This object may also be inherited from an iPhone template **415**. The object can also be inherited to a display UI **425** that is provided to devices that are not CSS enabled.

An exemplary method for delivering web content to an end user is illustrated in the flowchart of FIG. **5**. As with other methods described herein, the context analysis system **115** is utilized to perform the method. In some embodiments, to dynamically format a web page for an end user in accordance with the present technology, the method may include the context analysis system **115** determining **505** customer analytics of an end user and device related information for a first computing device used by the end user. As described above, this step may include collecting information from user profiles, a web browser client executed by the computing device, a database(s) of information, or other knowledge bases that include information about the end user or their computing device(s).

Once these various types of data have been determined by the context analysis system **115**, the method may then include the context analysis system **115** comparing **510** the customer analytics of an end user and the device related information for the first computing device used by the end user to a contextual vocabulary. Again, the contextual vocabulary includes context segments that define customer analytics of a plurality of end users and device related information for computing devices used by the plurality of end users. When the context analysis system **115** determines matches between the knowledge of the end user and various context segments in the contextual vocabulary, the context analysis system **115** may flag the context segments as being applicable. In some instances, the context analysis system **115** sets a Boolean flag when a context segment is appli-

cable. Generally, all Boolean flags for context segments are set to off prior to the comparison.

The context analysis system **115** may then assemble the context segments for the end user into a context segment path. More specifically, the method includes the context analysis system **115** generating **515** a context segment path for an end user. As mentioned above, the context segment path comprising a plurality of context segments that have been selected from the contextual vocabulary. Further, the context segment path is indicative of preferences of the end user and capabilities of the first computing device of the end user.

Once the context segment path is generated, the method includes the context analysis system **115** dynamically creating **520** a web page for the end user and their first computing device. In some embodiments the web page includes web content that is selected and formatted based upon the context segment path.

It is noteworthy that without the knowledge gleaned from the various resources, the web server that generates the web page may display a generic or basic web page for all end users and devices. The present technology allows for not only specific and targeted formatting of web pages that may be displayed differently by laptops and mobile devices, but the dynamic formatting of the present technology allows for alteration of a web page in light of the wide ranging and discrepant capabilities of mobile devices. Thus, the web server need not keep two or more versions of the same web page and serve these different web pages to clients depending on the computing device that they utilize. Advantageously, the context analysis system **115** generates a unique web page with unique web content and unique formatting for each end user that requests a web page. The context analysis system **115** dynamically generates these web pages on the fly or in near-real time as the web pages are requested by the end user.

The method illustrated in the flowchart of FIG. **6** illustrates a process whereby a web page is rendered in a unique manner for two different end users that utilize different computing devices than one another. Also, it will be assumed that the end users have unique preferences that can be determined from an analysis of behavior analytics. A behavior analytic includes, but is not limited to, explicit knowledge about the end user such as their deliberate actions on a website such as clicking of objects or queries. Behaviors may include any web analytics that would be known to one of ordinary skill in the art. Also, behavior analytics may include transaction and purchasing history or user profile parameters.

While behavior analytics include information that is similar to consumer analytics as described above, the behavior analytics are determined for an end user within the context of the delivery of content and are discussed separately for the purposes of clarity when describing a process of delivering content to an end user, as opposed to building a contextual vocabulary.

That is, consumer analytics include information that is used to build a contextual vocabulary. The consumer analytics are obtained from a plurality of end users for which relevant information can be obtained. The behavior analytics obtained from the end user during a process for dynamically generating content can be added to the contextual vocabulary such that the contextual vocabulary grows and evolves over time. Thus, behavior analytics can become consumer analytics that are eventually added to a contextual vocabulary.

FIG. **6** is a flowchart of another exemplary method for delivering web content. In contrast with the method of FIG. **5**, the method illustrated in FIG. **6** includes a process whereby the context analysis system **115** generates different versions of the same web page for two different end users that use two different types of computing devices relative to one another.

The method includes receiving **605** a request for a web page from a first computing device and a second computing device. For example, the computing devices transmit to a web server a request for a website at www.domain.com. Rather than returning to the computing devices the same HTML version for the domain the context analysis system **115** may generate HTML code that is unique for each end user and device combination.

Thus, the method includes the context analysis system **115** determining **610** behavior analytics of a first end user and device related information for a first computing device and behavior analytics of a second end user and device related information for a first computing device. Once the relevant data is obtained, the method includes the context analysis system **115** comparing **615** the behavior analytics and the device related information for the first and second end users to a contextual vocabulary that includes context segments that defines customer analytics of a plurality of end users and device related information for computing devices used by the plurality of end users.

Also, the method includes generating a context segment path for both the first and second end users. Again, the context segment path comprises a plurality of context segments that have been selected from the contextual vocabulary. Further, the context segment path is indicative of preferences of an end user and capabilities of a computing device of the end user.

After the assembly of context segment paths, the method includes the context analysis system **115** dynamically selecting **620** web content for the web page for the first end user is such a way that the web content is formatted based upon the context segment path of the first end user. Also, the method includes dynamically selecting **625** web content for the web page for the second end user. It will be understood that the web content for the second end user is formatted based upon the context segment path of the second end user in such a way that at least one of the web content or formatting of the web content is different for the first and second end users relative to one another.

FIG. **7** illustrates an exemplary computing device (also referred to herein as "computing system" or "system") **1** that may be used to implement an embodiment of the present systems and methods. The system **1** of FIG. **7** may be implemented in the contexts of the likes of computing devices, radios, terminals, networks, servers, or combinations thereof. The computing device **1** of FIG. **7** includes a processor **10** and main memory **20**. Main memory **20** stores, in part, instructions and data for execution by processor **10**. Main memory **20** may store the executable code when in operation. The system **1** of FIG. **7** further includes a mass storage device **30**, portable storage device **40**, output devices **50**, user input devices **60**, a display system **70**, and peripherals **80**.

The components shown in FIG. **7** are depicted as being connected via a single bus **90**. The components may be connected through one or more data transport means. Processor **10** and main memory **20** may be connected via a local microprocessor bus, and the mass storage device **30**, peripherals **80**, portable storage device **40**, and display system **70** may be connected via one or more input/output (I/O) buses.

Mass storage device **30**, which may be implemented with a magnetic disk drive or an optical disk drive, is a non-volatile storage device for storing data and instructions for use by processor **10**. Mass storage device **30** can store the system software for implementing embodiments of the present technology for purposes of loading that software into main memory **20**.

Portable storage device **40** operates in conjunction with a portable non-volatile storage medium, such as a floppy disk, compact disk or digital video disc, to input and output data and code to and from the computing system **1** of FIG. **7**. The system software for implementing embodiments of the present technology may be stored on such a portable medium and input to the computing system **1** via the portable storage device **40**.

Input devices **60** provide a portion of a user interface. Input devices **60** may include an alphanumeric keypad, such as a keyboard, for inputting alphanumeric and other information, or a pointing device, such as a mouse, a trackball, stylus, or cursor direction keys. Additionally, the system **1** as shown in FIG. **7** includes output devices **50**. Suitable output devices include speakers, printers, network interfaces, and monitors.

Display system **70** may include a liquid crystal display (LCD) or other suitable display device. Display system **70** receives textual and graphical information, and processes the information for output to the display device.

Peripherals **80** may include any type of computer support device to add additional functionality to the computing system. Peripherals **80** may include a modem or a router.

The components contained in the computing system **1** of FIG. **7** are those typically found in computing systems that may be suitable for use with embodiments of the present technology and are intended to represent a broad category of such computer components that are well known in the art. Thus, the computing system **1** can be a personal computer, hand held computing system, telephone, mobile computing system, workstation, server, minicomputer, mainframe computer, or any other computing system. The computer can also include different bus configurations, networked platforms, multi-processor platforms, etc. Various operating systems can be used including UNIX, Linux, Windows, Macintosh OS, Palm OS, and other suitable operating systems.

Some of the above-described functions may be composed of instructions that are stored on storage media (e.g., computer-readable medium). The instructions may be retrieved and executed by the processor. Some examples of storage media are memory devices, tapes, disks, and the like. The instructions are operational when executed by the processor to direct the processor to operate in accord with the technology. Those skilled in the art are familiar with instructions, processor(s), and storage media.

It is noteworthy that any hardware platform suitable for performing the processing described herein is suitable for use with the technology. The terms "computer-readable storage medium" and "computer-readable storage media" as used herein refer to any medium or media that participate in providing instructions to a CPU for execution. Such media can take many forms, including, but not limited to, non-volatile media, volatile media and transmission media. Non-volatile media include, for example, optical or magnetic disks, such as a fixed disk. Volatile media include dynamic memory, such as system RAM. Transmission media include coaxial cables, copper wire and fiber optics, among others, including the wires that comprise one embodiment of a bus. Transmission media can also take the form of acoustic or light waves, such as those generated during radio frequency (RF) and infrared (IR) data communications. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, a hard disk, magnetic tape, any other magnetic medium, a CD-ROM disk, digital video disk (DVD), any other optical medium, any other physical medium with patterns of marks or holes, a RAM, a PROM, an EPROM, an EEPROM, a FLASHEPROM, any other memory chip or data exchange adapter, a carrier wave, or any other medium from which a computer can read.

Various forms of computer-readable media may be involved in carrying one or more sequences of one or more instructions to a CPU for execution. A bus carries the data to system RAM, from which a CPU retrieves and executes the instructions. The instructions received by system RAM can optionally be stored on a fixed disk either before or after execution by a CPU.

Computer program code for carrying out operations for aspects of the present technology may be written in any combination of one or more programming languages, including an object oriented programming language such as Java, Smalltalk, C++ or the like and conventional procedural programming languages, such as the "C" programming language or similar programming languages. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

The corresponding structures, materials, acts, and equivalents of all means or step plus function elements in the claims below are intended to include any structure, material, or act for performing the function in combination with other claimed elements as specifically claimed. The description of the present technology has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the invention. Exemplary embodiments were chosen and described in order to best explain the principles of the present technology and its practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

Aspects of the present technology are described above with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer readable medium that can direct a computer, other programmable data processing apparatus, or other devices to function in a particular manner, such that the instructions stored in the computer readable medium produce an article of manufacture including instructions which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer, other programmable data processing apparatus, or other devices to cause a series of operational steps to be performed on the computer, other programmable apparatus or other devices to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide processes for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

The flowchart and block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods and computer program products according to various embodiments of the present technology. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and computer instructions.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. The descriptions are not intended to limit the scope of the technology to the particular forms set forth herein. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above-described exemplary embodiments. It should be understood that the above description is illustrative and not restrictive. To the contrary, the present descriptions are intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the technology as defined by the appended claims and otherwise appreciated by one of ordinary skill in the art. The scope of the technology should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the appended claims along with their full scope of equivalents.

What is claimed is:

1. A method for dynamically delivering web content using a contextual analysis system comprising a processor and a memory for storing logic, the processor executing the logic to perform the method, comprising:

determining end user behavior analytics and end user device information, the end user device information determined for a first computing device used by an end user;

comparing the determined end user behavior analytics and end user device information to context segments that define contextual information, the context segments included in a contextual vocabulary, the contextual information obtained for a plurality of consumers and computing devices used by the plurality of consumers;

flagging with Boolean flags a plurality of the context segments in the contextual vocabulary as being applicable segments for the end user based on the comparison and a match between the context segments in the contextual vocabulary and knowledge about the end user based on the end user's deliberate actions on at least one website;

generating a context segment path for the end user, the context segment path comprising a plurality of context segments that have been flagged from the contextual vocabulary, the context segment path being indicative of preferences of the end user and capabilities of the end user's first computing device; and

dynamically creating a web page for the end user and the end user's first computing device, the web page comprising web content that is selected and formatted based upon the context segment path.

2. The method according to claim **1**, wherein one or more of the context segments of the context segment path include a hierarchical representation that includes an ordering of the context segments to optimize discovery of resources for the web content.

3. The method according to claim **1**, wherein the context segment path is a string that uniquely defines context segment allocation for a given context, the context segment allocation identifying resources for the web content.

4. The method according to claim **3**, wherein the string is a cache key that is capable of being serialized and deserialized.

5. The method according to claim **3**, further comprising selecting a context segment path by comparing customer analytic information of the end user and device related information for a computing device of the end user to a plurality of context segment paths created from the context vocabulary.

6. The method according to claim **1**, further comprising determining a customer segmentation for the end user based upon both customer analytic information of the end user and device related information for a computing device of the end user.

7. The method according to claim **6**, further comprising storing the contextual information from the end user and the device related information for a computing device used by the end user in a context repository.

8. The method according to claim **1**, further comprising:

determining device related information for a second computing device used by the end user, the second computing device having device capabilities that are different from the first computing device;

generating another context segment path for the end user that includes context segments for the second computing device used by the end user selected from the contextual vocabulary; and

dynamically creating a web page for the end user and the second computing device, the web page having web content or formatting that is different than the web content or formatting that was created for the first computing device.

9. The method according to claim **1**, wherein the Boolean flags for context segments are set to off prior to the comparison.

10. The method according to claim **1**, wherein the contextual information is obtained from a plurality of information sources.

11. A contextual analysis system, comprising:
a processor; and
a memory for storing logic, the logic being executed by the processor to:
determine end user behavior analytics and end user device information, the end user device information determined for a first computing device used by an end user;
compare the determined end user behavior analytics and end user device information to context segments that define contextual information, the context segments included in a contextual vocabulary, the contextual information obtained for a plurality of consumers and computing devices used by the plurality of consumers;
flag with Boolean flags a plurality of the context segments in the contextual vocabulary as being applicable segments for the end user based on the comparison and a match between the context segments in the contextual vocabulary and knowledge about the end user based on the end user's deliberate actions on at least one website;
generate a context segment path for the end user, the context segment path comprising a plurality of context segments that have been flagged from the contextual vocabulary, the context segment path being indicative of preferences of the end user and capabilities of the end user's first computing device; and
dynamically create a web page for the end user and the end user's first computing device, the web page comprising web content that is selected and formatted based upon the context segment path.

12. The system according to claim 11, wherein one or more of the context segments of the context segment path include a hierarchical representation that includes an ordering of the context segments to optimize discovery of resources for the web content.

13. The system according to claim 11, wherein the context segment path is a string that uniquely defines context segment allocation for a given context, the context segment allocation identifying resources for the web content.

14. The system according to claim 13, wherein the string is a cache key that is capable of being serialized and de-serialized.

15. The system according to claim 13, wherein the processor further executes the logic to select the context segment path by comparing customer analytic information of the end user and device related information for a computing device of the end user to a plurality of context segment paths created from the context vocabulary.

16. The system according to claim 11, wherein the processor further executes the logic to determine a customer segmentation for the end user based upon both customer analytic information of the end user and device related information for a computing device of the end user.

17. The system according to claim 16, wherein the processor further executes the logic to store the contextual information from the end user and the device related information for a computing device used by the end user in a context repository.

18. The system according to claim 11, wherein the processor further executes the logic to:
determine device related information for a second computing device used by the end user, the second computing device having device capabilities that are different from the first computing device;
generate another context segment path for the end user that includes context segments for the second computing device used by the end user selected from the contextual vocabulary; and
dynamically create a web page for the end user and the second computing device, the web page having web content or formatting that is different than the web content or formatting that was created for the first computing device.

19. The system according to claim 11, wherein the Boolean flags for context segments are set to off prior to the comparison.

20. The system according to claim 11, wherein the contextual information is obtained from a plurality of information sources.

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